HEATED FILLING METHOD

This is a continuation-in-part of U.S. Application No. 09/752503, ~~filed~~ December 28, 2000, which claims the benefit of U.S. provisional application number ~~60/208456~~ 60/208,454 filed May ~~30~~ 31, 2000. Each of the foregoing applications is incorporated herein by reference in its entirety.

Field of The Invention

The present invention relates to the field of placing fill materials into the vias or holes of an electronic substrate.

Background of The Invention

A common structure in various electronics packages, such as laminate packages, wired circuit boards, ceramic substrates, and hybrid circuits, is a via or hole. A via or hole is a vertical opening which can be filled with conducting material used to connect circuits on various layers of a substrate or electronics packages to one another. Holes in certain devices may connect to a semi-conducting substrate. A hole generally starts as an empty cylindrical opening in an electronics package which is formed by drilling. The hole is then plated with an electrical conductor such as copper or tin. Plating may be done over the entire panel or device, or may be done with a pattern, dot, or button feature. The plating process results in a hole that is an opening with a plated, electrically conductive layer on the inner surface of the opening. Plating may also result in plating all or part of the surface of the device. Plating of the hole provides the primary electrical contact at the various layers within the device. The following step is to fill the hole with an electrically conductive, thermally conductive or nonconductive paste. The reasons for filling the hole after plating include providing a secondary or fail safe electrical connection, to provide structural integrity, to prevent chemical process entrapment from down-line operations, or to provide thermal conductivity to remove heat from the inner circuit layers of the resulting device. Another reason is that filling the hole also controls the breaking of electrical connections formed when the plate or finished electrical device thermally cycles between operating temperatures and non-operating temperatures.